REMARKS

Claims 1, 2, 5-11, 13-23, 29 and 30 are now pending in the application. Claims 3-4, 12, 24-28 and 31-33 were previously cancelled. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 103

Claims 1, 2, 5-9, 11, 13-15, 17-23, 29 and 30 stand rejected under 35 U.S.C. § 103(a) for allegedly being rendered obvious over Kobayashi et al. (U.S. Pat. Pub. No. 2002/0098396) (hereinafter "Kobayashi") in view of Heung (U.S. Pat. No. 6,015,041) (hereinafter "Heung"), Ovshinsky et al. (U.S. Pat. Pub. No. 2001/0033959) (hereinafter "'959"), and Bruck et al. (U.S. Pat. Pub. No. 2003/0129461) (hereinafter "Bruck"). This rejection is respectfully traversed.

Claim 10 stands rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Kobayashi in view of Heung, the Ovshinsky '959 publication, Bruck, and Ovshinsky et al. (U.S. Pat. Pub. No. 2004/0161652) (hereinafter "'652"). This rejection is respectfully traversed.

Claim 16 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Kobayashi in view of Heung, the Ovshinsky '959 publication, Bruck and Shreir et al. (Corrosion (3rd Edition)) (hereinafter "Shreir"). This rejection is respectfully traversed.

Applicants respectfully request reconsideration of the rejections, as a *prima facie* case of obviousness has not been established in view of the cited art. The cited art fails to describe or suggest each limitation of the presently claimed invention and thus,

reconsideration is requested. In particular, the prior art does not describe or suggest a fuel cell stack including a heating element having a body of thermally conductive material with a hydrogen storage medium disposed therein that is capable of reversibly storing and releasing hydrogen. As described in Applicants' specification, the integrated and renewable heating element provides self-regulated heating for a fuel cell stack corresponding to the fuel cell system operation, without the need for additional control systems, which is neither taught nor suggested by the prior art.

The deficiencies of the Koyabashi and Heung references have been discussed extensively in previous responses and are briefly summarized here. First, neither the Koyabashi nor the Heung reference describes or suggests an integrated heating element that is included within a fuel cell stack and is both in contact with and in a heat transfer relationship with a component of the stack to provide heating. Second, neither reference describes or suggests a heating element that is or can be directly integrated into a fuel cell stack. As such, the teachings of the Koyabashi and Heung references cannot support a rejection of obviousness because one of skill in the art would recognize the combination necessary to arrive at the presently claimed invention would result in an inoperable device. Obviousness cannot be predicated on a combination of references that produces a seemingly inoperable device. *McGinley v. Franklin Sports*, 60 USPQ.2d 1001, 1010 (Fed. Cir. 2001) *citing In re Sponnoble*, 160 USPQ 237, 244 (CCPA 1969). Koyabashi and Heung both teach away from the claimed invention, because they each teach using an insulation layer or heat transfer jacket around the device to prohibit heat transfer with the surrounding environments. Heung, Figure 1A; Col. 5, lines 12-15; Koyabashi, Paragraphs [0023] and [0089]. Storage vessels having

jackets or insulating layers could not be employed within a fuel cell stack for contact with a fuel cell component to transfer heat thereto.

Thus, the Koyabashi and the Heung references reiterate the state of the prior art, in that they teach independent heating systems that rely on indirect heating of a fuel cell via a coolant/fluid, which involves a significant heat sink. In contrast, the presently claimed invention provides an integrated heating element within a fuel cell, which eliminates additional processing and control systems and enhances heat transfer efficiency to and from the fuel cell stack. See for example, Applicants' specification at Paragraphs 33-34.

Even with the scope and content of the newly cited references, the combined references remain deficient in teaching or suggesting each limitation of the claimed invention, as set forth in independent Claims 1 and 29, for example. First, the newly cited references do not explain or overcome the teachings away from the present invention on the part of the Koyabashi and Heung references. Second, while the '959 publication is cited as teaching a metal hydride unit adjacent the anode of a fuel cell, it only describes an anode electrode itself. Thus, Applicants request reconsideration of the '959 publication and respectfully disagree that it teaches "a metal hydride unit adjacent the anode of a fuel cell," as asserted at Page 5, Paragraph 3 of the Non-Final Office Action mailed Dec. 14, 2007. Instead, the '959 publication only pertains to anode materials that improve electrochemical efficiency during splitting of hydrogen in an alkaline fuel cell: "Using conventional anode material, the dissociated hydrogen is transitional and the hydrogen atoms can easily recombine to form hydrogen if they are not used very efficiently in the oxidation reaction. With the hydrogen storage anode

materials of the inventive instant startup fuel cells, hydrogen is stored in hydride form as soon as they are created, and then are used as needed to provide power." Paragraph [0018]; see also, paragraph [0070]. Thus, the '959 application describes anode electrode materials that achieve the stated objective of more efficiently splitting hydrogen by storing split hydrogen molecules for short periods in the anode itself as a metal hydride prior to delivery to the adjacent alkaline electrolyte. However, there is no teaching or suggestion of any distinct element in the '959, much less a heating element adjacent to an anode containing a hydrogen storage medium; rather, the '959 teachings are limited to the anode.

The Bruck reference merely reiterates the prior art methods of heating fuel cells by electrical heaters, but has no bearing on self-regulating heating elements that employ a hydrogen storage material that reversibly stores hydrogen. Bruck describes the use of positive temperature coefficient (PTC) materials that are integrated into the fuel cell elements as bare metal wires, for example, for heating. *See e.g.*, Paragraph [0043]. As discussed in Bruck, such independent heating systems require additional electrical conduits, process controls and other equipment, which undesirably drain the fuel cell resources and require additional maintenance. Paragraphs [0012] ("the heating element with an integrated thermal sensor is, then, connected to a controller"), [0015] ("[t]he heating element has a connection for one or more voltage and energy sources, such as a battery, from which it is supplied with voltage/energy"), [0017]-[0020], [0024] (discussing the controller) and [0025]. *See also,* Applicants' Specification, [0033]. There is no apparent reason provided by Bruck to replace a conventional electrical

heating system with a self-regulating heater employing a hydrogen storage material that releasably stores hydrogen to generate heat for direct transfer to the fuel cell.

Lastly, the Ovshinsky '652 publication does not describe a heating element for a fuel cell and instead teaches away from the claimed invention. The '652 teaches a removable hydrogen storage container including a hydride that irreversibly stores hydrogen, in contrast to the hydrogen storage medium of the claimed invention (Claims 1 and 29), which absorbs and releases hydrogen in a reversible manner. Paragraph [0055]. The '652 further uses a significantly distinct hydrogen storage material that requires a reaction with water to release hydrogen from the hydride. Thus, water is introduced via a conduit to the container. Paragraphs [0055]-[0056]. Moreover, '652 does not describe direct contact of the hydrogen storage cartridges with the stack, but rather, describes positioning the hydrogen storage cartridges above the fuel cell stack to be in contact with the heated air exiting the top of the fuel cell stack via convection, as well as in thermal contact with electrolyte streams exiting the fuel cell stack. Paragraph [0056]. '652 teaches away from using hydrogen storage materials as a heater, particularly during start-up, describing the issues with desorption of hydrogen from metal hydrides due to unfavorable kinetics at cold temperatures. Paragraph [0056]. Hence, there is no suggestion or apparent reason in '652 to use a heating element having a reversible hydrogen storage material placed in direct contact with a component of a fuel cell stack in '652, nonetheless introducing a heating element that employs a reversible hydrogen storage material, which exothermically releases heat upon hydrogen uptake reaction to provide direct heat transfer to the stack during cold start-up.

The Shreir reference merely describes corrosion resistance properties of aluminum based alloys. Shreir fails to provide any apparent reason to provide a heating element in a fuel cell stack as claimed.

In sum, the scope and content of the cited prior art fails to establish a *prima facie* case of obviousness for the claimed invention. Nothing in the prior art suggests an independent heating element within a fuel cell stack that directly transfers heat thereto, where the heating element has a hydrogen storage medium that reversibly absorbs hydrogen in an exothermic reaction. Nor does any of the prior art suggest using a heating element capable of heating the stack in a self-regulating manner, without the need for additional equipment and control systems. Importantly, the prior art teaches away from the claimed invention and would be inoperable if used in accordance with the claimed invention. Even when the teachings of the Koyabashi, Heung, '959 Ovshinsky, Bruck, '652 Ovshinsky, and Shreir references are combined, there is still no reasonable expectation of success or any apparent reason to modify them in the manner necessary to arrive at the claimed invention. Accordingly, Applicants respectfully request reconsideration of the rejections and allowance of independent Claims 1 and 29 and their respective dependent Claims 2, 5-11, 13-23 and 30.

Lastly, at Paragraph 9, p. 9 of the Office Action, the Examiner refers to U. S. Patent Publication 2006/0051638 filed on September 3, 2004 to Gross as "prior art" of record. Applicants wish to clarify that the Gross application was filed on September 3, 2004, well after the filing date of the present application (October 8, 2003) and therefore, cannot be prior art under 35 U.S.C. § 102. To the contrary, the present application is prior art to the Gross application and not *vice versa*.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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By: Jennifer Woodside Wojtala
Anna M. Budde
Reg. No. 35,085

Jennifer M. Woodside Wojtala
Reg. No. 50,721

HARNESS, DICKEY & PIERCE, P.L.C.
P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

JMW/slg